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SELF-SELECTION IN RESPONDING TO A HEALTH RISK APPRAISAL: ARE WE PREACHING TO THE CHOIR?

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Self-Selection in Responding to a Health Risk Appraisal: Are We Preaching to the Choir?

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SUMMARY

Problem

Although the health risk appraisal (HRA) has been widely adopted as a procedure to improve heath behaviors, there is only limited empirical evidence that these quantitative risk messages have any effect. The level of participation of high risk individuals is also unclear.

Objective

The objectives of the present study were (a) to examine behavioral and sociodemographic factors associated with voluntary response to an HRA, and (b) to assess the effect of HRA feedback on subsequent preventive health behaviors and risk taking behaviors.

Approach

Subsequent to the collection of baseline health behavior data from a larger sample participating in a Navy-wide health and physical readiness evaluation, an HRA was mailed to a random sub-sample of 625 individuals. A total of 270 (43%) people responded to the HRA. These individuals were then matched with a control group who did not receive an HRA, and health behavior data were again collected on both groups one year later.

Results

An analysis of the factors associated with responding to the HRA revealed that respondents were older, better educated, had higher health status, smoked less, consumed less alcohol, and used seat belts more than non-respondents. Separate analyses of HRA respondents and matched controls indicated that HRA participation had no significant effect on subsequent preventive health behaviors or risk taking behaviors.

Conclusions

Among individuals who tend to engage in high risk behaviors, denial may represent an effective strategy to underestimate risk and, thereby, mitigate against seeking objective feedback to the contrary. Younger and less educated individuals may also be more likely to discount the adverse effects of high risk health behaviors as just another menace of daily life. Given the limitations in the participation of high risk individuals and the lack of empirical support for its effectiveness, the potential of the HRA as an effective cue to action remains uncertain.

SELF-SELECTION IN RESPONDING TO A HEALTH RISK APPRAISAL: ARE WE PREACHING TO THE CHOIR?

D. Stephen Nice, Ph.D.
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Susan W. Conway, M.A.

Health Risk Appraisal (HRA) has been defined as a procedure for using epidemiologic and vital statistics data to provide individuals with projections of their personalized mortality risk and with recommendations for reducing that risk, for the purpose of promoting desirable changes in health behavior (Schoenbach, Wagner, and Beery, 1987). Although originally conceptualized as a risk reduction adjunct within clinical medicine, the HRA procedure has been most widely adopted in health education and health promotion programs outside of clinical medicine, especially in worksites.

Yet, as Schoenbach and his colleagues point out, despite the dedication and considerable investments that have gone into HRAs' development, dissemination, and use, there is only limited empirical evidence that these quantitative risk messages have any effect on clients. While many studies have reported favorable health-related behavior change among individuals who have participated in HRA programs, critical reviews of this literature (cf. Schoenbach, Wagner, and Beery, 1987; Beery, Schoenbach, Wagner, et.al., 1986; Doerr and Hutchins, 1981) have identified serious methodological problems in much of the work. Many studies, for example, confounded the effect of an HRA with other health promotion factors such as counseling, or lacked a comparison group to control for the effects of secular change. Many other studies relied exclusively on individuals who had volunteered to participate in a health promotion program and who may therefore, have been more motivated to make changes in their lives.

While many of the studies conducted in this area have been seriously flawed, there are some exceptions. In a well controlled study of AT&T employees, Spilman and her colleagues (1986) examined the effects of a comprehensive health promotion program, the Total Life Concept, on a number of biometric, health risk, and attitudinal indices. The quasiexperimental design included the following three groups; (1) HRA and health education, (2) HRA only, and (3) attention control. At the end of one year, results indicated

significantly greater improvements in Group 1 than in Group 2 for diastolic blood pressure, serum cholesterol, Type A behavior pattern, and body weight. However, demographic differences and the unavailability of preprogram measures in Group 3 precluded an assessment of the independent effects of the HRA. In a separate study of HRA, health education, and HRA plus health education, Dunton and Elias (1979) demonstrated that the HRA intervention, used in conjunction with standard medical assessment, significantly improved health risk and attitudes.

In a paper on the effectiveness and utility of HRAs, Becker and Janz (1987) observed that the HRA, whether administered as a stand-alone instrument or within the context of a larger health promotion program, ensured that the client would be exposed to a basic, minimum health promotion message, and thereby, overcame a major limitation of mass media based health promotion messages. The degree of this advantage, however, would appear to be contingent upon the participation of moderate to high risk clients. Although a number of investigators have considered the varying degrees of applicability and acceptance of HRA feedback by different subgroups of the population (Fielding, 1982; Goetz and McTyre, 1981; Jenkins, 1979; Milio, 1976), the sociodemographic or behavioral factors associated with responding to an HRA instrument have remained relatively unexplored. Spilman and her colleagues (1986), for example, reported that in their study only 54 percent of all employees invited to take the HRA actually did so, and that only "certain types" of employees responded. A more detailed analysis of the non-respondents in the AT&T program (Bellingham, Johnson, and McCauley, 1985) revealed that, in general, non-respondents smoked more, were younger, had less formal education, used seat belts less and had less faith that exercise and stress management would improve their health. Similarly, Dunton and Elias (1979) reported that only 62 percent of the subjects who initially enrolled in their HRA study completed all follow-up examinations and results sessions. In a comparison to subjects who attended all visits, subjects who missed one or more follow-up sessions were younger and had less favorable values for self-reported current health status, smoking status, seat belt use, depression, alcohol intake, percent overweight, and projected risk. Finally, factors such as sex, and to a lesser extent age and education, have been shown to affect health information seeking (Hibbard and Weeks, 1987) and may, likewise, influence an individual's propensity to respond to an HRA.

The purposes of the present study were (a) to examine behavioral and sociodemographic factors associated with voluntary response to an HRA, and (b) to assess the effect of HRA feedback on subsequent preventive health behaviors and risk taking behaviors. It was hypothesized that individuals who were older, more educated, reported a higher level of current health status, or engaged in more healthful lifestyle behaviors would be significantly more likely to complete an HRA. In addition, it was hypothesized that individuals who completed an HRA would demonstrate a significantly greater improvement in their preventive health and risk taking behaviors than individuals in a matched control group.

METHODS

Participants

Subjects were 625 individuals randomly selected from participants in a larger Navy-wide longitudinal health promotion evaluation. This sample of 625 was similar to the overall Navy, consisting of 90.8% men and 9.2% women. The average age was 29 years (S.D.=6.95) with a range from 20-51 years. Average years of school completed were 12.5 (S.D.=1.00) with a range from 8-20 years. Enlisted personnel comprised 89% and officers 11% of the sample. The median paygrade was E5, with a range from E1 to O6.

Procedure

As part of a Navy-wide longitudinal health promotion evaluation, a lifestyle and health attitude questionnaire was mailed to a random sample of 5,487 Navy personnel in October, 1986. One month later, a Health Risk Appraisal, called the Personal Risk Profile, developed and administered by General Health, Inc., was mailed to the randomly selected subset of individuals described above. These participants were instructed to return the completed HRA to General Health, Inc. in a prepaid envelop provided in the administration packet. Medical confidentiality was assured, and a comprehensive, easily interpretable feedback report with color graphics was sent directly to each participant. A physician summary for each individual was forwarded by General Health, Inc. to the research team at the Naval Health Research Center. For purposes of this study, the physician summary was used only to confirm a subject's participation in the HRA intervention. A total of 270 (43%) Personal Risk Profiles were completed and returned to General Health, Inc..

In October, 1987, a one-year follow-up lifestyle and health attitude questionnaire was mailed to all participants in the original Navy-wide sample who remained on active duty. Of the 270 individuals who had responded to the initial lifestyle questionnaire and had participated in the HRA intervention, 93 provided 1987 follow-up lifestyle information. These 93 individuals were matched with a control group who had responded to the initial and follow-up questionnaires, but had not been selected to receive an HRA. A case-by-case match was conducted on the following hierarchy of variables: average amount smoked per week, average number of alcoholic drinks per week, average number of kilocalories expended in exercise each week (computed from an exercise activity scale), sex, and age. When an exact match could not be obtained, the closest approximation was substituted (Table 1).

Table 1

Mean Comparisons of Participants to a Matched Control Group

Matched Variable	Participants (N=93)	Matched Control (N=93)
Amount smoked weekly	5.0	5.1
Number of drinks weekly	6.0	5.4
Expended kilocalories weekly	2,186	2,114
Age	29.8	29.7
Sex (%)		
Male	90.3	90.3
Female	9.7	9.7

Questionnaire

The lifestyle and attitude questionnaire assessed a wide range of health-related behaviors, attitudes, values, and perceptions. Specific variables examined in this report included several demographic and health-related measures.

Demographic variables. Participants provided information about their age, sex, and years of education.

Health status. Participants rated their current health on a scale ranging from 1 ("Poor") to 5 ("Excellent").

Health behavior measures. Participants completed a Health Behavior Checklist indicating how well each specific health behavior described his or her usual behavior. Response options ranged from 1 ("Not at all like me") to 5 ("Very much like me"). As outlined by Vickers, Conway, and Hervig (1988), forty items were empirically organized into four dimensions of health behavior: Wellness Maintenance and Enhancement, Accident Control, Traffic Risk, and Substance Use Risk. Appendix A provides specific health behavior items comprising each scale.

In addition to the four health behavior scales, three other measures of lifestyle behavior were used to provide a more direct assessment of smoking behavior, alcohol consumption, and exercise activity. Smoking behavior was assessed as the average daily number of cigarettes, cigars, and pipefuls smoked during the past week, and used a 10-category response scale: 0, 1-5, 6-10, 11-15, 16-20, 21-25, 26-30, 31-35, 36-40, and 41+. A measure of weekly alcohol use was computed as the product of the average number of drinks consumed per day during the last week and the number of days one drank during that week. An index of exercise activity was based on total kilocalories expended per week in nine types of physical activity: running, bicycling, swimming, racket sports, continuous walking, aerobics, calisthenics, weight lifting, and basketball. Participants reported the number of times per week they engaged in each activity (frequency) and the number of minutes they generally spent in one workout period for each activity (duration). Kilocalories expended per minute were assigned for each activity using the tables of energy expenditure in McArdle, Katch, and Katch (1986). The number of kilocalories required for each activity was multiplied by the total time in minutes per week the participant reported engaging in that activity (frequency X duration), then summed across all activities for a weekly estimate of exercise-related energy expenditure. This value was then used as a measure of exercise activity.

A final health behavior measure addressed seat belt use. Participants described their usual behavior in regard to wearing a seat belt on a scale ranging from 1 ("Not at all like me") to 5 ("Very much like me").

RESULTS

Separate analyses were computed to determine the demographic and behavioral factors associated with HRA response compliance. The Bonferroni correction (Miller, 1966) was applied to adjust for the potential capitalization on chance inherent in multiple t-test comparisons, and the significance level (α) was adjusted to .01 for a one-tailed test. A series of four t-tests for independent samples was computed to assess mean differences between HRA respondents and non-respondents on age, sex, years of education and current health status. As shown in Table 2, HRA respondents were significantly older, more educated, and had higher health status than non-respondents. A series of four t-tests for independent samples was then computed to assess mean differences between HRA respondents and non-respondents on smoking behavior, alcohol consumption, exercise activity, and seat belt use. These results indicated that individuals who chose to respond to the HRA smoked less, drank less alcohol, and wore seat belts more frequently than those who chose not to respond (Table 3).

Table 2

Comparison of HRA Respondents and Non-respondents on Demographic Variables

	Mean		t
Demographic variable	Respondents	Non-respondents	
Age	29.51	27.79	-2.28*
Sex	1.10	1.12	.71
Education	13.39	12.64	-3.58*
Current health status	3.80	3.59	-2.22*

*$p < .01$

Table 3

Comparison of HRA Respondents and Non-respondents on Health Behavior Measures

	Mean		t
Health Behavior	Respondents	Non-respondents	
Smoking behavior	5.81	9.75	3.22*
Alcohol consumption	6.64	9.90	2.39*
Exercise activity	2,158	1,832	-1.79
Seat belt use	4.13	3.72	-2.92*

*$p < .01$

A separate repeated measures analysis of variance (ANOVA) was computed to assess the effect of HRA participation on each of the following dimensions of health behavior; wellness maintenance and enhancement, accident control, traffic risk, and substance use risk. The individuals who responded to the HRA and their controls represented the between subjects factor, and time of assessment (pre-versus-post HRA) represented the within subjects factor. As shown in Table 4, none of the main effects or the interaction effects were significant. These results indicated that the HRA intervention had no significant effect on subsequent health behaviors.

Additional repeated measures analyses of variance were then computed to assess the effect of HRA participation on amount of alcohol consumed, amount smoked, and exercise activity. Although none of the interaction effects were significant, the amount smoked increased and exercise activity decreased for both groups during the course of the study (Table 5). Because this effect was contrary to general trends in the Navy (Conway, Trent, and Conway, 1989) and it occurred among individuals who exhibited more positive pre-test lifestyle behaviors than the norm, it may reflect an artifact of regression to the mean.

Table 4

Results of Repeated Measures ANOVAs Comparing HRA Respondents and Controls on Four Dimensions of Health Behavior

Summary Table - Wellness Maintenance and Enhancement

	SS	DF	MS	F	Sig of F
Between-Subjects Effect					
Within Cells	175.41	180	.97		
Group	1.50	1	1.50	1.54	ns
Within-Subjects Effect					
Within Cells	24.40	180	.14		
Time	.10	1	.10	.76	ns
Group X Time	.14	1	.14	1.04	ns

Summary Table - Accident Control

	SS	DF	MS	F	Sig of F
Between-Subjects Effect					
Within Cells	179.30	183	.98		
Group	.10	1	.10	.10	ns
Within-Subjects Effect					
Within Cells	33.33	183	.18		
Time	.02	1	.02	.11	ns
Group X Time	.05	1	.05	.26	ns

Summary Table - Traffic Risk

	SS	DF	MS	F	Sig of F
Between-Subjects Effect					
Within Cells	160.45	180	.89		
Group	.02	1	.02	.03	ns
Within-Subjects Effect					
Within Cells	30.13	180	.17		
Time	.20	1	.20	1.22	ns
Group X Time	.01	1	.01	.05	ns

Summary Table - Substance Use Risk

	SS	DF	MS	F	Sig of F
Between-Subjects Effect					
Within Cells	258.24	183	1.41		
Group	.04	1	.04	.03	ns
Within-Subjects Effect					
Within Cells	79.72	183	.44		
Time	.48	1	.48	1.11	ns
Group X Time	.08	1	.08	.18	ns

Table 5

Results of Repeated Measures ANOVAs Comparing HRA Respondents and Controls on Smoking, Alcohol Consumption, and Exercise Activity

Summary Table - Smoking

	SS	DF	MS	F	Sig of F
Between-Subjects Effect					
Within Cells	34558.12	178	194.15		
Group	.01	1	.10	.00	ns
Within-Subjects Effect					
Within Cells	3190.26	178	17.92		
Time	157.34	1	157.34	8.78	.003
Group X Time	6.40	1	6.40	.36	ns

Summary Table - Alcohol Consumption

	SS	DF	MS	F	Sig of F
Between-Subjects Effect					
Within Cells	17967.21	180	99.82		
Group	13.98	1	13.98	.14	ns
Within-Subjects Effect					
Within Cells	8680.30	180	48.22		
Time	8.56	1	8.56	.18	ns
Group X Time	14.89	1	14.89	.31	ns

Summary Table - Exercise Activity

	SS	DF	MS	F	Sig of F
Between-Subjects Effect					
Within Cells	606572509	176	3446434		
Group	932357	1	932357	.27	ns
Within-Subjects Effect					
Within Cells	271863564	176	1544679		
Time	14652119	1	14652120	9.49	.002
Group X Time	2393944	1	2393944	1.55	ns

DISCUSSION

Results of this study indicated that individuals who chose not to respond to an HRA were younger, less educated, and engaged in more high risk health behaviors like smoking, alcohol consumption, and not wearing seat belts. As McDowell (1988) points out, people are caught in a dilemma when told that familiar and pleasurable behavior may be causing them harm. Among individuals who tend to engage in high risk behaviors, denial may represent an effective strategy to underestimate risk and, thereby, mitigate against seeking objective feedback to the contrary. Younger and less educated individuals may also be more likely to discount the adverse effects of high risk health behaviors as just another component of what Feinstein (1988) refers to as the "menace of daily life". The potential process of discounting the adverse effects of high risk health behaviors may also contribute to the self-selection bias in responding to an HRA. Whether the HRA is used to gauge the risk of a defined population, modify the health behavior of an individual client, or perform any number of other potential roles, participation bias presents a formidable problem.

The self-selection of individuals with more positive health behaviors also introduces a restriction of range in the criterion variables often used in HRA research and thereby reduces the power of the statistical methods applied. Although this bias may have marginally contributed to the absence of any significant group by time interaction effects in the present study, the ineffectiveness of the HRA as an independent intervention strategy is believed to be primarily due to the complexity of human needs, values, and behaviors. Humans have always lived with risks and do not necessarily equate risk with personal danger (McDowell, 1988). Given the benefits that people perceive in behavior that also brings risks, we should not assume that the average person will necessarily view information on risks as a stimulus to change his or her behavior, particularly as broader social forces continue to encourage health risk behaviors (McDowell, 1988). In fact, it is now well accepted in health education that no single intervention strategy is capable of producing long-term changes in important behaviors (Green, 1978).

The future of the HRA as a potentially viable component of more comprehensive health education or health promotion programs may depend upon the participation of a more representative distribution of the population.

Although Murphy (1984) urges some caution in the use of overly complex market analysis in health promotion, an inspection of the HRA market segmentation (i.e., the identification of groups which express homogeneous health needs and values) and differentiated target marketing (Kotler, 1984) could enhance the distribution of HRA participation. In addition, immediate HRA feedback on a computer terminal may be more powerful than the current mail feedback system (Goetz and McTyre, 1981) and could reach younger, high risk segments of the population. Although the introduction of these and other techniques may reduce self-selection bias and avail the HRA to those for which it was originally intended, the potential of the HRA as an effective cue to action remains uncertain.

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Appendix A

Health Behavior Scales*

1. Wellness Maintenance and Enhancement (10 items): average alpha = .77

14. I exercise to stay healthy.
31. I gather information on things that affect my health by watching television and reading books, newspapers, or magazine articles.
8. I see a doctor for regular checkups.
22. I see a dentist for regular checkups
30. I discuss health with friends, neighbors, and relatives.
23. I limit my intake of foods like coffee, sugar, fats, etc.
32. I use dental floss regularly.
11. I watch my weight.
25. I take vitamins.
35. I take health food supplements (e.g. protein additives, wheat germ, bran, lecithin).

2. Accident Control (6 items): average alpha = .65

3. I keep emergency numbers near the phone.
7. I destroy old or unused medicines.
6. I have a first aid kit in my home.
19. I check the condition of electrical appliances, the car, etc. to avoid accidents.
21. I fix broken things around my home right away.
36. I learn first aid techniques.

3. Traffic Risk (7 items): average alpha = .70

28. I cross busy streets in the middle of the block.
38. I take more chances doing things than the average person.
33. I speed while driving.
5. I take chances when crossing the street.
12. I carefully obey traffic rules so I won't have accidents. [reverse scored]
15. I cross the street against the stop light.
40. I engage in activities or hobbies where accidents are possible (e.g. motorcycle riding, skiing, using power tools, sky or skin diving, hang-gliding. etc.).

4. Substance Use Risk (3 items): average alpha = .50

26. I do not drink alcohol. [reverse scored]
18. I don't take chemical substances which might injure my health (e.g. food additives, drugs, stimulants). [reverse scored]
17. I don't smoke. [reverse scored]

* See Vickers, et al., 1988 for scale development.

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